**Natural Resource Challenge Report FY 2003**
**Crown of the Continent Research Learning Center: Waterton-Glacier International Peace Park**

## 1. Center Description

The Crown of the Continent Research Learning Center (CCRLC) hired two full-time staff members in 2003. The Director, Dr. Leigh Welling, assumed duties in January and the Resource Education Specialist, Dr. Sallie Hejl, arrived in August. The Center is currently recruiting for a part-time Administrative Assistant and the position is expected to be filled by January 2004.

Offices for CCRLC staff are in a converted Mission 66 house within the Glacier National Park (GNP) headquarters area. The newly renovated facility contains a multimedia conference/presentation room, a state-of-the-art computer lab for research, education, and training activities, and can accommodate up to 5 full-time employees and 6 visiting faculty or students. GNP has also dedicated a second, three-bedroom Mission 66 residence to provide bunk space for visiting scientists, students, and other collaborators. The residence has recently been converted to bunkhouse style accommodations that will sleep up to 7 adults.

The mission of the CCRLC, developed within the context of the Natural Resource Challenge, is *to initiate and facilitate learning and scientific inquiry in and about the Crown of the Continent Ecosystem so that communities, both regional and global, can make informed decisions as stewards of the region's vast repositories of cultural and natural resources.*

Goals of the Center are to:

1) *Attract and facilitate research in Waterton-Glacier International Peace Park and the surrounding Crown of the Continent Ecosystem (CCE)*
    a) Build and strengthen partnerships with universities and other science organizations
    b) Encourage the use of parks as research laboratories by providing visiting researchers with necessary accommodations
    c) Identify gaps in existing knowledge and solicit research to fill them
2) *Encourage and support science-based management decisions toward protection of CCE cultural and natural resources*
    a) Facilitate communication and information exchange among park managers, resource specialists, research scientists, interpreters, and educators
    b) Foster collaborations that fit specific management needs for environmental information into broader research contexts
    c) Identify, synthesize, and disseminate research results that address management needs
3) *Coordinate educational and outreach initiatives that transfer up-to-date knowledge about park resources to the public*
    a) Develop and maintain a web enabled "virtual" park Learning Center that presents research results and real-time access to ongoing projects in the CCE
    b) Provide hands-on opportunities for high school to adult learners to become involved in park research

c) Promote the integration of CCE resource information into standards-based curricula through teacher training workshops and partnerships with public schools and other educational organizations

Center goals were developed through interactions and feedback from researchers, park managers, resource personnel, interpreters, and educators who participated in a Roundtable in May 2003. The Roundtable was designed specifically to solicit input on their needs and vision for the newly established Crown of the Continent Research Learning Center. Enhancing research, helping to make that research useful to the park, and disseminating results are the three cornerstones of the CCRLC goals.

Considerable effort was spent this year building Learning Center staff, creating appropriate work space and housing for the Center, and establishing working relations with park personnel and partners. Connecting with the scientific community and identifying research needs was also a high priority in 2003 and this effort will continue to be emphasized in 2004. Many of the projects reported here represent support the CCRLC provided for existing initiatives and activities being carried out by park resource managers and cooperating agencies such as the USGS science teams and other research partners. While most new initiatives under development through the CCRLC have simply not had time to bear fruit, there are several projects described in the report that could not have taken place without the presence of the Learning Center in the park. These are highlighted with an asterisk (*).

## 2. Research

### 2a. and 2b. Projects Facilitated by the CCRLC with Associated NPS and Leveraged Funds

* Monitoring Glaciers Using Aerial Photography – Michelle Manly, Earth System Science Institute, University of North Dakota (UND). This is a Master's student project conducted in GNP to develop a precise method of monitoring rates of glacial melting using remote sensing and geographic information systems. The project is collaborative with Dr. Daniel Fagre at the USGS Northern Rocky Mountain Science Center. The Learning Center was responsible for placing the student with the research team in the park and contributed both technical and scientific oversight as the work progressed. NPS dollar amounts reported below refer to travel and housing costs. Research and academic components of the project have been completed and the final manuscript is currently under revision for submission to a peer-reviewed journal.

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| Contributors: | NPS - | $1,000 |
| | USGS - | $11,000 |
| | UND - | $36,000 |

* Saving the Grizzly, One Hair at a Time – John Shier, Science and Natural History Filmmaking Program, Montana State University (MSU). This is a Master's student project to develop a 15-minute film, in VHS format, that chronicles the use of DNA to assess grizzly bear population levels and trends in Glacier National Park and the surrounding ecosystem. The project was conducted in collaboration with Kate Kendall of the USGS Rocky Mountain Science Center. The film was developed primarily to inform park interpreters and other agency representatives but is

appropriate as an educational tool in the high-school classroom as well. The Learning Center initiated contact between the student and the research team and provided critical reviews of the work. NPS funds reported below represent production and editing costs and media supplies. The project was completed in December 2003 and a longer version of the film is now being developed as an outreach product for distribution on public television.

Contributors: NPS - $10,000
MSU - $17,750

Invasive Plant Survey and Mapping – Shana Wood, Department of Land Resources and Environmental Sciences, Montana State University. This research is being done as part of the Intermountain Region's Inventory and Monitoring effort to survey and map noxious weed infestations in the National Park units. Dawn LaFleur, a Supervisory Biologist at GNP is coordinating the project. NPS CCRLC contribution reported below refers to value added** to the project through low cost housing provided by the Learning Center to the 4-person survey team during summer 2003. Discussions are underway to develop a remote sensing application through the CCRLC in 2004 for monitoring invasions of weeds into park backcountry habitat.

Contributors: NPS I&M - reported elsewhere in GNP's 2003 NRC Report
NPS CCRLC - $3,000

Western Airborne Contaminants Project (WACAP) – Dixon Landers, USEPA, National Health and Environmental Effects Research Laboratory, Corvallis, Oregon. The purpose of the project is to evaluate ecological impacts of airborne contaminants in National Parks. The GNP site work is being coordinated by Bill Michels, an aquatic biologist at GNP. The NPS contribution reported below represents value added** to the project through low cost housing provided by the CCRLC for a two-person field crew during summer 2003.

Contributors: EPA - unknown
NPS - $300

Habitat Use Patterns and Presence of Rare Forest Carnivores – Steve Gehman, Wild Things Unlimited, Bozeman, MT. The focus of the study is to conduct tracking surveys, set up and monitor remote camera sites, and collect DNA material for analysis (with an emphasis on lynx and fisher). The project is collaborative with Flathead National Forest. Jean Tabbert, an educational specialist at GNP is coordinating the park sites for this project. The NPS contribution reported below represents value added** to the project through low cost housing provided by the CCRLC for a 3-person field crew during summer 2003.

Contributors: USFS – unknown
NPS - $225

**An important contribution Research Learning Centers make toward facilitating research in the national parks is to provide housing to scientists at minimal costs in regions of the country with high tourism (consequently high rates for accommodations). Use of the CCRLC residence is charged at standard GNP dormitory rates, which are under $5/person/night. The "value added" to the research project is the difference between this rate and that which would be charged through facilities run by private owners or concessionaires within or outside the park (calculated at $75/person/night).

## 2b. A Research Project Highlight

* Monitoring Global Change in Glacier National Park – Michelle Manly, a Fargo, North Dakota native, never imagined she would be conducting research on the glaciers of a park she had grown to love through summers spent mountaineering with her father in GNP's wilderness. With a BS in Geology, Michelle had a keen appreciation for the spectacular glacially carved terrain and high alpine glaciers that are the hallmark of this mountain park. But it was not until she embarked on a graduate program in Earth Systems Science and took a course in Climate Change Assessment that she learned the greatly accelerated rate at which this mountain landscape is currently changing.

Of the 150 glaciers that were first estimated in GNP at around 1860, fewer than 37 remain today. Many of the remaining glaciers are mere remnants of what they were when they first began retreating at the end of the Little Ice Age about 150 years ago. The locations and extent of glaciers in GNP have been measured many times since the late 1800s and modelers have predicted various scenarios for the glaciers' ultimate demise. By all accounts, humans have greatly accelerated glacial melting through burning of fossil fuels; the question is, "by how much?" One of the greatest obstacles to answering this question has been lack of detailed measurements for calculating glacial mass balances. Beyond having value as GNP landmarks, glaciers provide base flow for mountain streams and aquatic habitats are very sensitive to changes in timing and amount of water supply. Glaciers are touchstones for the entire ecosystem.

Michelle's curiosity, coupled with an existing research connection between the park and her home institution at the University of North Dakota, enabled her to contribute significantly to the research on glaciers in GNP through a combination of intensive field work and state-of-the-art geospatial technologies. Using a full set of scanned, digitized aerial photographs of the park, combined with ground-truthed GPS data points, Michelle was able to accurately determine the areal extent of all glaciers in the park, thereby providing a new comprehensive baseline of glacial conditions for 1998 (photo 1). These data will provide a critical tool for park scientists to determine current rates of glacial retreat so that they may, in turn, inform resource managers, park interpreters, and the public about the state of our mountain ecosystem.

## 3. Science for the Public

* Our Changing Planet – A public television interstitial series, developed by the Upper Midwest Aerospace Consortium at the University of North Dakota (UND), has produced two 90-second episodes about research being conducted in GNP for national distribution. "Melting at Glacier Park" and "Global Change in Mountain Ecosystems," describe the rapid demise of mountain glaciers in northwestern Montana and the impacts a warming climate is having on the mountain ecosystem. The program is a very successful outreach tool about climate and environmental change that is being distributed through the National Educational Telecommunications Association (NETA) to approximately 40 stations nationwide. Many of these stations are statewide networks that reach hundreds of thousands to millions of households. UND contributed $4,500 for production costs; the CCRLC provided $1,500 as in-kind support by writing the original talking points as well as undertaking multiple reviews of the scripts.

* International Environmental Change Teacher Workshop – Nineteen K-12 teachers from Bulgaria, Italy, and Switzerland as well as the states of Maine, Arizona, Massachusetts, Texas, and New Jersey traveled to Glacier National Park for a four-day workshop on snow and ice July 7-11, 2003 (photo 2). Activities ranged from classroom presentations of ice core temperature records and the use of remote sensing and GIS to monitor glacial changes to a 10-mile hike into Grinnell Glacier. Participants worked together in teams to develop strategies for teaching about climate and environmental change in both science and non-science classrooms. The workshop was co-sponsored by the Crown of the Continent Research Learning Center at Glacier National Park and the Wright Center for Innovative Science Education at Tufts University in Boston, MA. The CCRLC provided $1,000 actual and $3,000 in-kind support for the workshop.

Native Plant Restoration Education Program – Glacier National Park's Native Plant Restoration Program has an education program that involves local residents and students in all aspects of operation. The program includes working in the nursery, planting and seed collection in campgrounds in the Lake McDonald Valley, and related educational activities. During the winter, students grow up to 10,000 plants in greenhouses at schools in the valley and on the Blackfoot Reservation. Program facilitators are Joyce Lapp and Sonja Hartman. The Learning Center supports training and orientation for this program.

Shipwrecks in Unexpected Places - Submerged lands in the National Park System have a significant cultural legacy and GNP has large natural lakes with an associated maritime history, including several shipwreck sites. In an effort to communicate this concept to the public, the Submerged Resources Center (SRC) through a partnership with Montana State University, Black Dog Productions and the National Center for Preservation Technology and Training (NCPTT) are currently finishing a series of six 30-minute documentaries focusing on NPS stewardship of submerged sites. Episode Five, with a working title of "Shipwrecks in Unexpected Places", will highlight the maritime history and cultural resources submerged in Yellowstone NP and Glacier NP. The CCRLC provided housing, with a value-added estimate of $900, for the production team to shoot interviews with cultural resources staff and generate underwater footage to tell this unique story.

## 4. Partnerships

### 4a. List of Current Partners that Provide Funds or Actively Participate in Center Activities

Rocky Mountain Cooperative Ecosystem Studies Unit, Missoula, MT
Contact: Kathy Tonnessen, Research Coordinator; 406/443-4449; kathy_tonnessen@nps.gov
The RM CESU has provided seed money for CCRLC projects and is an important partner for identifying research partners that can address park needs.

Glacier Natural History Association, West Glacier, MT
Contact: Wendy Hill, Executive Director; 406/888-5756; whill@glacierassociation.org
GNHA has provided funding for CCRLC educational materials and activities.

US Geological Survey, Northern Rocky Mountain Science Center Glacier Field Station, West Glacier, MT

Contacts: Dan Fagre, Ecologist; 406/888-7922; dan_fagre@usgs.gov
Kate Kendall, Biologist; 406/888-7994; Katherine_kendall@usg.gov
Carl Key, Geographer; 406/888-7991; carl_key@usgs.gov

The USGS scientists stationed in GNP are key CCRLC partners. Several collaborative projects are described in this report.

Upper Midwest Aerospace Consortium, University of North Dakota, Grand Forks, ND

Contact: George Seielstad, Chair; 701/777-4577; gseielst@aero.und.edu

UMAC has provided funding to support research and education activities related to climate change in GNP and those involving Native Americans.

Salish-Kootenai College, Polson, MT

Contacts: Pat Hurley, Director of Environmental Studies; 406/275-4895; pat_hurley@skc.edu
Tammie Grant, Remote Sensing and GIS Instructor; 415/380-8747; tamgrant@attbi.com

SKC is an educational partner with which the CCRLC is developing curricula and internship opportunities for students to develop skill in the use of geospatial technologies for management of protected lands

Crown of the Continent Ecosystem Education Consortium, Kalispell, MT

Contact: Lex Blood, founder; 406/756-3170

COCEEC brings a bioregional focus to education in the Crown of the Continent Ecosystem and actively develops materials and resources used by the CCRLC to disseminate information about the park and surrounding region to others partners, collaborators, and the public.

Continental Divide Research and Learning Center, Rocky Mountain National Park, CO

Contact: Terry Terrell, Research Administrator; 970/586-1282; terry_terrell@nps.gov

The ROMO and GNP Learning Centers both serve the Intermountain Region for the NPS. The two Learning Centers maintain close communication on research and educational strategies and provide a forum through which the two parks can develop and maintain broader regional perspectives.

**4b. New Partner Highlights**

Flathead Lake Biological Research Station, Yellow Bay, MT

Contacts: Ric Hauer, Aquatic Biologist; 406/982-3301; rhauer@selway.umt.edu
Mark Lorang, Geomorphology/Physical Ecology; 406/982-3301; mlorang@selway.umt.edu

Research scientists at FLBS are currently collaborating with the CCRLC on several research topics of interest to park managers: 1) understanding the effects of fire on watersheds, 2) use of hydrologic models for resource management, 3) baseline assessment of native fish habitat. They have participated in CCRLC Roundtable discussions and we are partnering on research applications proposals to solicit funds to support joint efforts to develop decision support tools for park managers.

Environmental Protection Agency Climate Friendly Parks Program, Washington, DC
Contact: Karen Scott, Communications Specialist; 202-564-3482;
karen.scott@epamail.epa.gov
The CCRLC is currently co-organizing a joint EPA/NPS workshop to he held December 9-10 in Kalispell, MT. This partnership combines the EPA's global change educational activities with the NPS's sustainability efforts, spearheaded by Shawn Norton out of the WASO office. The partnership is expected to be ongoing as the workshop outcome will involve a variety of follow-up activities that will be supported through this program.

National Center for Atmospheric Research, Atmospheric Technology Division, Boulder, CO
Contact: David Carlson, Director; 303/497-8833; dcarlson@ucar.edu
The NCAR ATD is collaborating with the CCRLC and the USGS to deploy a wireless sensor array in GNP that will provide real-time access to a variety of ecologically significant measures of environmental health. The instrumentation, currently in prototype status, will allow a high degree of flexibility for studying complex ecosystems and steep terrain. Glacier is being targeted for early deployment and testing of the equipment. The project is of great interest to ecological and geological scientists who seek to understand the biogeochemical cycles in mountain ecosystems. Research and educational objectives are being integrated during the planning phase of the project so that access to environmental information will be available from the outset to the public as well as to scientists and park staff.

National Center for Landscape Fire Analysis, University of Montana, Missoula, MT
Contact: Lloyd Queen, Director; 406/243-2000; lpqueen@ntsg.umt.edu
The NCLFA develops research applications to improve fire and fuels management at the landscape scale using remote sensing and GIS tools. The group is very interested in working with GNP fire specialists and managers. CCRLC is facilitating a new partnership between the NCLFA and GNP that will help to provide park fire and natural resource managers with enhanced decision-making tools toward fire prediction, incident response, risk analysis, prescribed burns, and ecosystem restoration efforts.

## 5. Other Highlights

### 5a. Innovative Approaches

The CCRLC has placed considerable emphasis on encouraging and enhancing the use of science-based knowledge to support management decisions in GNP (Goal 2 for the Center). For this goal to succeed requires patience, persistence, and the ability to communicate across traditional knowledge boundaries. Decision support involves asking managers what their needs are, brainstorming with scientists about new knowledge frontiers, and identifying ways in which these two perspectives on environmental inquiry are complementary. The key is to appreciate the urgency of park management issues while not losing sight of the need for accurate, objective environmental information.

When asked to identify particular issues they are grappling with that require a scientific underpinning AND are opportunities for education and learning, GNP park managers produced the following list. The list represents topical areas within which the CCRLC is developing more focused projects.

Recreational impacts on wildlife and wildlife habitat (riparian areas; backcountry)
Fire (ecology/effects/history/severity/mapping)
Exotics (invasion vectors/mapping/monitoring)
Biodiversity (inventories; identifying and monitoring 'vital signs')
Climatic context (range of variation/trends)

Ways in which the CCRLC is currently providing decision support range from identifying appropriate outside research partners to collaborating on internal and external funding calls (with an emphasis on providing science context) to offering communication forums for the exchange of information and ideas. Currently under development is a research catalogue outlining key areas of concern, which will be made available on the web to solicit research partner participation. The CCRLC web site (under construction) will be an important venue for information dissemination to park employees as well as the public.

**5b. Other Significant Achievements**

1) With the hiring of a Director in January and a Resource Educational Specialist August of 2003, the CCRLC made significant progress.

2) Renovation of the Research Learning Center administrative facility was fully completed in July. The facility can provide work space for up to 5 full-time employees and an additional 6 visiting faculty or students. Other aspects of the Center include a multimedia conference/presentation room, and a computer enhanced learning environment that is designed to facilitate the ability of park research and education partners to interact and learn from one another by sharing knowledge and materials. The lab will be used for management trainings, educational workshops, and basic research about the park and surrounding region.

3) Conversion of the CCRLC residence to a bunkhouse style accommodation allows the Center to maximize opportunities for research partners to undertake field work in Glacier. Low cost housing has been identified as a key to encouraging research in the park. The residence is designed primarily for short-term needs on the order of 3 weeks or less and not intended as a summer or sabbatical residence. Other housing will be made available for the latter requirements. Particular projects that were supported this year were described in Sections 2 and 3. In addition, the CCRLC residence has been made available for participants in back country, fire, and bear management trainings.

4) On May 28, 2003 the CCRLC held a 3-hour Roundtable on objectives and priorities for the newly established Research Learning Center. Thirty participants from research, park resources and interpretation, and education gathered together to discuss those needs and visions they felt appropriate for the CCRLC to address.

An overarching theme from all discussions centered on the need for better communication and information exchange among park managers, resource specialists, research scientists, interpreters, and educators. The Learning Center can and should provide a forum for communication and a means for building support toward environmental sustainability and stewardship. Roundtable participants, from both small group and large group discussions, repeatedly used words like 'bridge', 'join', 'link', 'bring together', 'disseminate' etc. to describe their needs and their perceptions of how the CCLC can most effectively carry out its mission. The following list represents some specific suggestions that were offered during roundtable discussions for how this might best be accomplished. These suggestions were used to develop Center goals.

a. Help assemble historical baseline data
b. Consolidate and summarize information and make it available on a public website
c. Identify gaps in existing information/knowledge and post this information
d. Bridge information gaps with contacts (management ←→science)
e. Help managers fit their specific environmental information needs into broader research contexts
f. Foster collaborative efforts for acquiring needed data/knowledge
g. Facilitate communication between a number of entities and the transference of needs/information from one to another
h. Ensure research projects are developed in a way that consider education/outreach objectives from the beginning
i. Disseminate results of successful collaborations both inside and outside the park